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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,125	02/08/2001	Robert L. Gerlach	F069-2	1681

25784 7590 07/09/2003

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EXAMINER

SOUW, BERNARD E

ART UNIT	PAPER NUMBER
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2881

DATE MAILED: 07/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/781,125

Applicant(s)

GERLACH ET AL. 

Examiner

Bernard E Souw

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05/07/2003 (Paper No. 4/a).
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02/08/2001 (except for Fig. 6) is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 07 May 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Applicant's Amendments

1. The Amendment A, Paper No. 4/a, filed on 05/07/2003, has been entered.
New claims 26-30 have been added.
Pending in this office Action are claims 1-30
The present Office Action is made with all the suggested amendments being fully considered.

Drawings Objections Withdrawn

2. The apparent deficiencies have been adequately explained, the previous objections to Fig. 2A and 2B are now withdrawn.
3. Fig. 6 having been properly amended, the previous objection is now withdrawn.

Objection to the Specification Withdrawn

4. The specification having been properly amended, the previous objections are also withdrawn.

Claim Objection Withdrawn

5. Claim 13 having been properly amended, the previous objection is here withdrawn.

§ 112 Rejections Withdrawn

6. The apparent contradictions in claims 7 and 8 having been adequately explained, their previous rejections under U.S.C. §112, second paragraph, are herewith withdrawn.

7. Claims 10 and 11 having been properly amended, the previous rejections are also withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 4-6 and 17-19 *stand rejected* under 35 U.S.C. 103(a) as being unpatentable over Jones et al. (USPAT # 4,902,898) in view of Stengl (USPAT # 4,985,634).

9. Regarding claim 1, Jones et al. invent an apparatus including multiple ion guns and multiple associated optical columns for focused ion beam (FIB) processing of materials or imaging, comprising:

- one or more ion gun chambers, addressed as one of the “*monolithic ion source*” recited in the Abstract, last paragraph, lines 4-5 from bottom, and more specifically as ion source 182 shown in Fig.10, recited in Col.9/ll.8-15;

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■ one or more ion guns (sources) 190 positioned within each of the one or more ion gun chambers 182 shown in Fig.10, as recited in Col.9/II.14-25, or – in case of a single ion source -- ion gun chamber 22 shown in Fig.1, as recited in Col.2/II.61-68, each of the ion gun chambers 22 (or 182) capable of generating an ion beam, as recited in Col.2/II.63-65.

However, Jones's ion source 182/Fig.10 and 22/Fig.1 is not expressly described in the disclosure as being *sealed*, although the sealed condition is inherent in Jones's due to the subsequent high vacuum region 194 including the array column 184, as recited in Col.9/II.9/II.20-25.

Stengl et al. disclose an ion gun 12 shown in Fig.2 that forms a chamber separated (i.e., vacuum-isolated) from the subsequent optical column. As such, Stengl's ion gun is essentially sealed, more specifically vacuum-sealed by vacuum-valve 36 shown in Fig.2, as recited in Col.9/II. 46-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Stengl's ion gun 12 of Fig.2 for Jones's ion source 182 of Fig.10, since Stengl's ion gun is also used in a focused ion beam column device similar to Jones's for the same purpose of ion beam lithography.

One would have been motivated to use Stengl's ion gun in place of Jones's ion source, since Stengl's ion gun, for being a conventional low pressure ionization source, is capable of handling a larger variety of gas species than Jones's diffusion-based device.

Jones's apparatus (as modified by Stengl's) further comprises:

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- multiple ion optical columns 20 shown in Fig.1, which is equivalent to optical column 128 shown in Fig.7, each optical column being associated with one of the multiple ion guns for focusing and directing the corresponding ion beam toward a target 44 in Fig.1, as recited in Col.2/ll.67-68 & Col.3/ll.1-2, or the top plate (unlabeled) in Fig.7, as recited by Jones et al. in Col.7/ll.61-65;

- a primary vacuum chamber 194 shown in Fig.10, equivalent to the vacuum housing containing ion beam column 20 and deflectors assembly 46 shown in Fig.1, as recited in Col.3/ll.36-39, for containing a target 44 for processing, as recited Col.3/ll.30-35, for processing or imaging, as recited in Col.3/ll.19-24 and Col.3/ll.24-30, respectively.

- Stengl's also shows in Fig.2 an ion optical column 14 shown in Fig.2, as recited in Col.8/ll.41-46 and Col.9/ll.20-25, as well as a target 248.

Stengl's modification of Jones's device further shows:

- a vacuum valve 36 associated with each of the ion guns shown in Fig.2, as recited in Col.9/ll. 46-50.

- Although not specifically recited, it would have been a mere matter of design choice to selectively open Stengl's vacuum valves 36 to allow the ion beam to pass from the ion gun to the target, or selectively closing to seal the ion chamber, since the motivation is obvious and the skill therefor required is only routine in the art.

10. Regarding claim 4, the use of a vacuum pump for (each) ion gun chamber is inherent in Stengl, as implicated by the vacuum condition recited in Col.9/ll. 46-50.

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11. Regarding claim 5, the use of a single control to open and close (all) the vacuum valves is a mere matter of design choice that only involves routine skill in the art, and hence, unpatentable.

12. Regarding claim 6, the use of a deceleration lens element maintained near ground potential is rendered obvious by Stengl in Col.14/II.20-22 and Col.14/II.43-46, wherein the motivation and necessity regarding a ground potential is expressly given by Stengl in Col.13/II.25-19.

13. Regarding claims 17-19, all the limitations are conventional for FIB columns, and hence, inherent in both Jones's and Stengl's. See e.g. Jones's Col.3/II.68 & Col.4/II.1-11 and Col.9/II.32-68 & Col.10/II.1-17, as well as Stengl's Col.8 to Col.28.

14. Claims 15 and 16 *stand rejected* under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, as previously applied to parent claim 1, and further in view of Mack (USPAT # 6,222,196 B1).

The limitation regarding beam column tilt is inherent in Jones's, addressed by the parameter θ as part of the x,y, θ scan, as recited in Col.3/II.5-25. However, a beam tilt of about three degrees is expressly recited by Mack in Col.6/II.12-42 in reference to Fig.4A & 4B. It would have been obvious to one of ordinary skill in the art at the time the

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invention was made to tilt the beam(s) by about three degrees, since this amount of tilt is known to be appropriate with regard to the purpose thereby envisioned.

Mack may have made his about 0 to 10 degree beam tilt for a purpose different than Applicant. However, Applicant's differing purpose (to maximize sputtering instead of minimizing it) does not alter the conclusion that Applicant's use of a prior art device (Jones's & Stengl's as modified by Mack), would be *prima facie* obvious from the purpose disclosed in the reference. *In re Lintner*, 173 USPQ 560.

15. Claims 2, 3, 7, 8 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, as previously applied to parent claim 1, and further in view of Ngo et al. (Proceeding 43rd International Conference on EIPBTN).

► Regarding claims 2 and 3, Jones et al. as modified by Stengl shows all the claim limitations, except the recitation that a single ion gun chamber may contain one or more ion guns.

► Regarding claim 2, Ngo et al. disclose a sealable ion gun chamber shown in Fig.1 equipped with a multiple of extraction holes, as seen in Fig.1 and recited on pg.241, third paragraph/section.

Specifically regarding claim 3, the recitation of a multiple sealable ion gun chambers each including one or more ion guns is a mere duplication of parts. The court held that mere duplication of parts has no patentable significance unless a new and

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unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

► Claims 7 and 8 are rejected as being unpatentable over Jones et al. in view of Stengl, and further in view of Ngo et al.

Jones et al. as modified by Stengl, and further modified by Ngo et al. show all the limitations of claim 7, including the use of a conductor bar to provide a reference voltage, as shown in Ngo's first one of the two perforated electrodes shown in Fig.1, which is entirely made of copper, and hence, is on a single potential, as recited on pg. 241, 3rd paragraph, lines 3-4.

Jones et al. as modified by Stengl, and further modified by Ngo et al. show all the limitations of claim 8, including the use of a second of the two perforated electrodes shown in Fig.1, of which only the beam passage is coated with copper, thus allowing the beamlets to be individually switched on and off, as recited on pg.241, 3rd paragraph, lines 4-8, or alternatively, to allow independent control of the optical elements, as known to one of ordinary skill in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jones's and Stengl's ion gun by Ngo's teaching of using two perforated plate electrodes to produce a multiple ion beam column of controlled pattern, since a multiple of electrostatic lenses that can be separately controlled can be formed by applying different potentials to the holes of the second plate, as suggested by Ngo et al. on page 241, 3rd paragraph, lines 4-8.

► Regarding claims 20-23, Jones et al. as modified by Stengl and Ngo et al. show all the claimed limitations, as previously applied to claims 7 and 8.

16. Claims 9-11 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, and further in view of Lo et al. (USPAT # 6,232,787).

Jones et al. as modified by Stengl show all the limitations of claim 9, as previously applied to the parent claim 1, except the recitation of multiple lens elements and further comprising a means for collecting secondary particles through a lens element for imaging or characterizing the target surface.

Multiple lens elements are inherent in Jones's, as shown by elements 48 and 50 in Fig.1 and recited in Col.3/II.29-32. Multiple lens elements are also inherent in Stengl's, as shown by element 196 in Fig.2b and recited in Col.12/II.34-37.

Lo et al. disclose a charged particle beam system for inspecting a target wafer surface, as recited in the Abstract. Lo's CPB imaging system comprises a means (detector 132 in Fig.1) for collecting secondary particles through a lens element 126, as recited in Col.4/II.23-34 and II.39-65.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a means for collecting secondary particles as suggested by Lo et al., since forming an image from collected secondary particles emitted by the irradiated surface is conventional to many CPB systems.

It would have been further obvious to one of ordinary skill in the art at the time the invention was made to collect the secondary particles through the same lens element used for focusing and deflecting the primary ion beam (column), so the two types of particles can be automatically separated based on their electrical charge, as also suggested by Lo et al.

17. Regarding claim 10, the recitation of a deflector is rendered obvious by Stengl's in Col.14/II.14-51, and the recitation in claim 11 regarding lens element(s) that accelerate the charged secondary particles through the lens element for detection, is rendered obvious by Lo et al. in Col.4/II.II.23-34 and II.39-65.

18. Regarding claim 13, Jones et al. as modified by Stengl and Ngo et al. show all the claim limitations, as previously applied to the parent claim 9, including the use of a combination of magnetic and electrostatic field deflector, as recited in Col.4/II.23-35, acting as a filter for mass & velocity, as generally known in the art.

19. Specifically regarding claim 14, the use of a mass spectrometer for detecting and characterizing the secondary charged particles, i.e., as a specific form of filter for mass and velocity as in claim 13, is a mere matter of design choice, which is here not patentable, since it only involves routine skill in the art.

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20. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl and Lo et al. (discarding Krans et al. (USPAT # 6,218,664 B1)).

Jones et al. as modified by Stengl and Lo et al. show all the limitations of claim 12, as previously applied to the parent claim 9, including Lo's detector 132 shown in Fig.1, which is a photomultiplier-scintillator combination recited in Col.4/ll.32-34, except the additional limitation of a center hole for the primary hole to pass through.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to place a multiple of Lo's detector 132 around the opening not specifically drawn in Fig.1, but more illustrative in Fig.2 in (a multiple of) detector 204 around the opening 206, and further, to make the multiple detectors contiguous, thus forming a single annular detector, since increasing the efficiency of a detector by multiplying their number and unifying those multiple of detectors into a single one having the same sensitive surface area are both prima facie obvious.

One would have been motivated to increase the detector efficiency in order to enhance the accuracy of detection by reducing its signal to noise ratio.

21. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl and Ngo et al., as previously applied to claims 20-23, and further in view of Lo et al. (USPAT # 6,232,787).

Regarding claim 24, Jones et al. as modified by Stengl and Ngo et al. show all the claim limitations, except of some limitation specific to the parent claim 20, which has been rendered obvious by Lo et al.. This includes the recitation of a means for

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collecting secondary particles through a lens element for imaging or characterizing the target surface, as previously applied to claims 9 and 20.

Regarding claim 25, the application of a high bias voltage to the emitter & suppressor elements is conventional and inherent in Jones's and Stengl's, as generally known in the art. Regarding a specific voltage of 2000 V, this Official Notice is supported by McKenna et al., as disclosed in Col.6/line 39.

Rejection of New Claims

22. Claims 26 and 27 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl.

Claims 26 and 27 recites limitations that are already comprised in the limitations of claim 1, whereby one of ordinary skill in the art understands, there is no substantial distinction between ion gun and ion source, since an ion gun is conventionally made of an ion source.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to position two or more ion guns within one (or more) ion gun chambers, since ion gun chambers are vacuum compartments having no other function except to house the ion guns and keep them under vacuum.

It would have been further obvious to one of ordinary skill in the art at the time the invention was made to associate each ion source with one of the multiple guns, since an ion gun is conventionally made of an ion source.

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23. Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, and further in view of Tao et al. (USPAT # 5,104,684) .

Jones et al. as modified by Stengl show all the limitations of claims 28 and 29, as previously applied to their parent claims 1 and 28, except the recitation of liquid metal ion source, specifically gallium.

Tao et al. disclose an ion beam for processing of materials, as recited in Col.1/ll.9-17. Tao's ion beam is generated by a liquid metal ion source, specifically gallium, as recited in Col.3/ll.8-12 and col.4/ll.49-52.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a liquid metal ion source for processing of materials, since this type of ion source is conventional for producing a focused beam of metal ions.

It would have been further obvious to one of ordinary skill in the art at the time the invention was made to use gallium as metal in a liquid metal ion source, since gallium is a frequently used element in the various processes of making semiconductor devices, as taught by Tao et al. in Col.3/ll.64-68 & col.4/ll.1-48.

24. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl and Lo et al., as previously applied to claim 9.

The limitations of claim 30 are essentially the same as those of claim 9. Claim 30 is therefore rejected under the same reasons over the same prior arts as claim 9.

Double Patenting

25. Claims 1-24 of this application conflict with claims 1-26 of copending Application No. 09/780,876 (Patent Application Publication US 2001/0032938 A1). 37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. Applicant is required to either cancel the conflicting claims from all but one application or maintain a clear line of demarcation between the applications. See MPEP § 822.

Non-Statutory Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

26. Claims 1-30 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-26 of copending Application No. 09/780,876 (Patent Application Publication US

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2001/0032938 A1). Although the conflicting claims are not identical, they are not patentably distinct from each other because:

- Claims 1, 12 and 26-29, either alone or in combination, are obvious over claim 1 of the copending Application, further interpreted in light of its specification, i.e., paragraph [1010] reciting the duplication and/or multiplication of ion gun(s) to form the limitations of claims 1 & 12 of the current application, i.e., ion beam column;
- Claim 12 is obvious over claims 5, 14, and 23 of the copending Application,
- Claim 11 is obvious over claim 2 of the copending Application;
- Claims 9 and 30 are obvious over claim 3 of the copending Application;
- Claim 10 is obvious over a combination of claims 9 and 24 of the copending Application;
- Claim 13 is obvious over a combination of claims 4 and 22 of the copending Application;
- Claim 12 is obvious over claim 6 of the copending Application;
- Claim 6 is obvious over a combination of claim 7, 8, 10, 11, 25 and 26 of the copending Application;
- Claims 7 and 9 in combination are obvious over specific combinations of claims 10 and 11 of the copending Appl.;
- Claim 20-23 are obvious over various combinations of claims 13-19 of the copending Application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Final Rejection

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Response to Applicant's Arguments

Applicant's arguments filed 05/07/2003 (paper no. 4/a) have been fully considered but they are not persuasive. The following is the Examiner's response to Applicant's arguments.

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28. Regarding claim 1, Applicant's use of the wording "*one or more*" is essentially broader than just "*one*". Therefore, Applicant's claim 1 is broader than, and hence obvious over Jones, in which only one ion gun and one ion gun chamber are used.

Furthermore, an extension to "*more*" (i.e., multiple) ion guns/chambers does not lend patentability to the claim, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Beyond the above reasons, Applicant's distinction between Applicant's multiple ion guns and Jones's single ion gun that is distributed into multiple ion beam columns is not persuasive, because Jones's single ion source is also recited in Applicant's claim.

29. Still regarding claim 1, Applicant's argument that Jones uses the ion source for a different purpose does not alter the conclusion that Applicant's use of a prior art device (i.e., Jones's) would be *prima facie* obvious from the purpose disclosed in the reference. *In re Lintner*, 173 USPQ 560.

30. Regarding claims 2 and 3, Applicant's rebuttal of Ngo's is misplaced. Ion gun conventionally is, or at least can, be made of plasma ion source. The triviality of extending Ngo's single ion gun and single ion source chamber to multiple units of the same has been addressed previously, so is also the fact that Applicant's use or purpose is different than Ngo's.

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31. Regarding claim 8, the recitation of a "*bar*" in the claims is not essential for the proper functioning of Applicant's device. Important is only the isolation of one optical element from the other in case of a multiple of ion beam columns. The obviousness of extending single ion beam column to multiple beam columns has been addressed previously. It would have been further obvious to one of ordinary skill in the art that extending to multiple beam columns would inherently and conventionally need electrical isolations of one optical element from the other, in order to have individual control of each ion beam column.

32. Regarding claims 9-11 and 13-14, to convert Lo's magnetic-immersion type of electron lens into electrostatic ion lens is conventional and well known in the art.

33. Regarding claim 12, Applicant's argument against Krans as prior art, on the ground that Krans's invention is commonly owned by FEI, is well taken. However, Krans is not at all necessary for the rejection of claim 12. As recited in the previous Office Action on page 14, claim 12 is already rejected by Lo's detector 132 shown in Fig.1, since one of ordinary skill in the art would not need Krans's help to come to the idea of placing a multiple of Lo's detector 132 around the opening not specifically drawn in Fig.1, but more illustrative in Fig.2 in (a multiple of) detector 204 around the opening 206, which only needs a small step further to make the multiple detectors contiguous, thus forming a single annular detector, as recited in claim 12.

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34. Regarding claims 15 and 16, it does not matter at all what Applicant wants to believe, even less under Applicant's uncertainty about the details of Jones's invention as expressed in Paper No.4/a on page 19, lines 8-11. What really matters is here what ordinary skill in the art would see as a whole in the combination of Jones's with Stengl's and Mack's. In a §103 case, references are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. *In re Bozek*, 163 USPQ 545 (CCPA) 1969. Thus Applicant's attack on Jones's individually is not justified.

Furthermore, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA 1971).

The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In the present case, Jones's parameter θ receives the interpretation of a tilt angle, no matter whether it is achieved by tilting the beam or the sample stage, because the effect would be the same.

Applicant's argument that Mack uses his about three degrees beam tilt angle to increase implantation depth into the substrate and to minimize the sputtering effect, which is just the opposite of Applicant's purpose of increasing the sputtering, is exactly

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covered by the Examiner's reason also cited by Applicant (Paper No. 4/a, pg.19, lines 14-15), i.e., "*since this amount of tilt is known to be appropriate with regard to the purpose thereby envisioned*". It is obvious to one of ordinary skill in the art, that, given the same sample surface conditions including crystal lattice orientation, the tilt angle that minimizes sputtering will be about the same as that for maximizing it. This angle is determined by the crystalline condition of the surface, but not by the purpose. Although the absolute **angular position** of the ion beam axis relative to the crystal lattice is the opposite for the two different purposes, the range of **tilt angle** (i.e., the **change** of angular position from an initially random position) required to maximize or minimize the effect, will be approximately the same.

In this specific case, the rationale to modify or combine the prior arts of Jones's Stengl's and Mack's does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness '*from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference*'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

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35. Regarding claims 20-23, the triviality of single and multiple ion sources or beamlets, as well as the conventional need to electrically isolate the optical elements, have been previously discussed. The limitation of a specifically *flat conductive bar* recited in claim 22 is not essential or critical for the proper functioning of the device or method.

36. Applicant's argument against the Double Patenting rejection applied in the previous Office Action is unpersuasive, because a multicolumn FIBS is an obvious variation of a single column FIBS. Furthermore, in the previous Office Action it has been unambiguously recited, that, "*although the conflicting claims are not identical, they are not patentably distinct from each other*", because of various reasons as specified.

37. In conclusion, all the previous claim rejections, including the Double Patenting rejections, are proper. They are repeated in the following sections, with minor changes (underlined) being introduced to address Applicant's specific arguments.

38. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
June 29, 2003


JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800